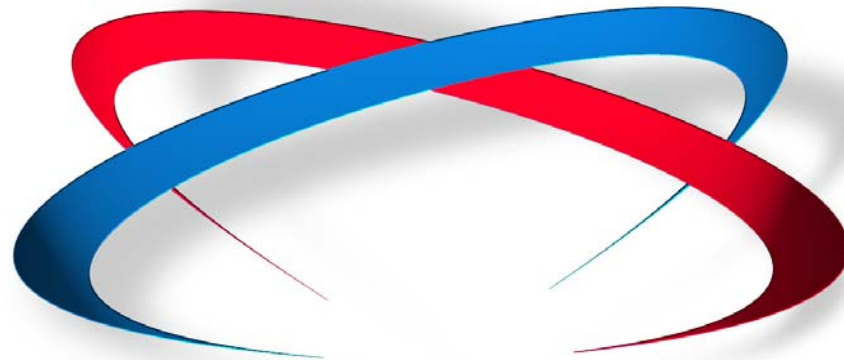


Status of SAE CRP150

14FEB07

William R. Hill
Chairperson of SAE CRP150



VDA Alternative Refrigerant Winter Meeting

Contents

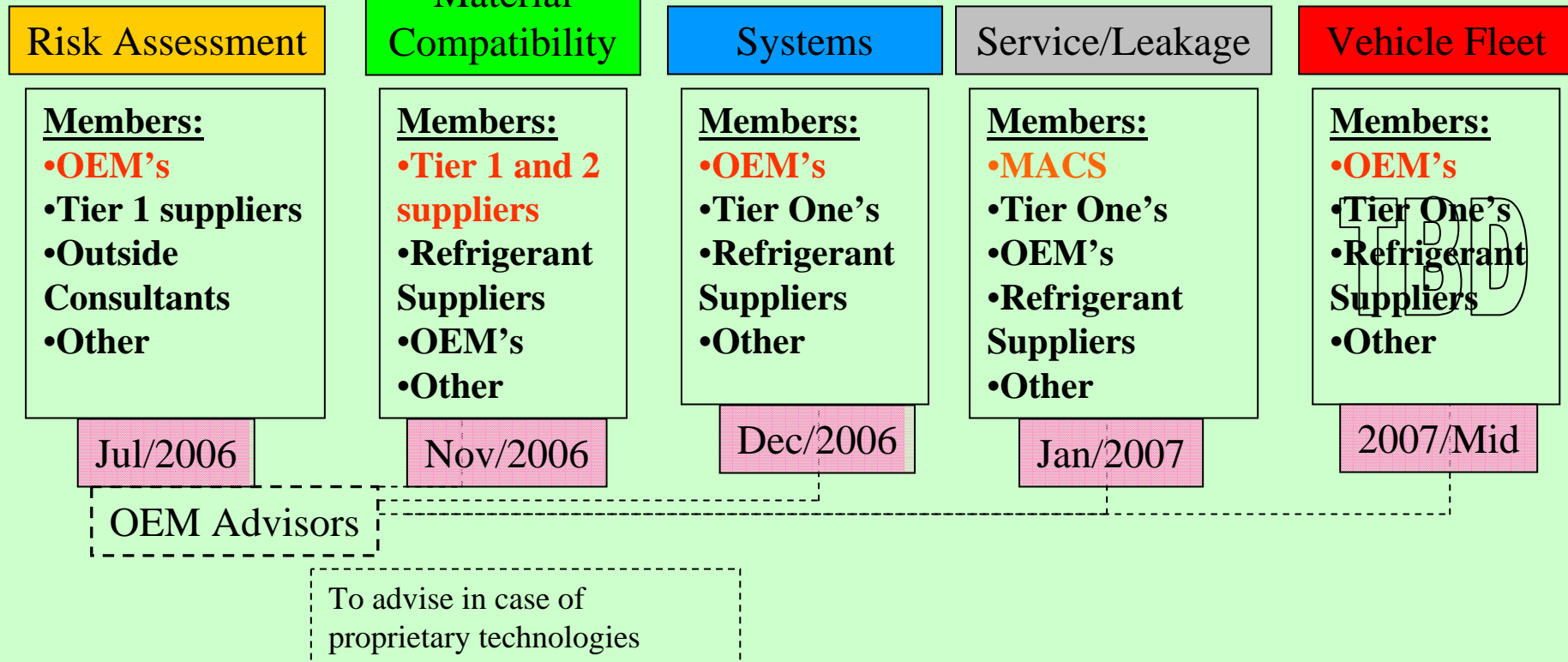
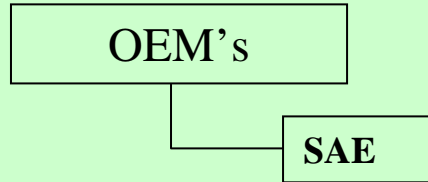
- ❖ Overview
- ❖ CRP150-1 status
- ❖ CRP150-2 status
- ❖ CRP150-3 status
- ❖ CRP150-4 plan
- ❖ Summary

Formation History

- ❖ Initially proposed at 2006 SAE Congress of Interior Climate Control Standards Committee meeting in Detroit
 - Invitations to join were delivered in May, 2006
- ❖ Discussed again at the 2006 SAE Alternate Refrigerant System Symposium in Phoenix
 - OEM's agreed that this was a good approach and agreed to support
 - Formal invitations were again delivered in July, 2006
- ❖ Team one meetings on Toxicology began in August, 2006
 - Contract toxicologist hired in November, 2006
- ❖ Team two meetings on material compatibility began in early November, 2006
- ❖ Team three meetings on performance evaluations began in late November, 2006
- ❖ Team four first meeting on 02FEb2007

SAE CRP150 Project Organization

CORE GROUP



Refrigerant Companies

Honeywell [USA]	Active in CRP150-1,2,3
Ineos Fluor [Great Britain]	Active in CRP150-1,2,3
Solvay [France]	Active in CRP150-1,2,3
DuPont [USA-participation TBD]	Still discussing possible participation
Sinochem [China]	No contact
Arkema [USA]	No contact
Others??	

CRP150 Contributing Companies

<u>Team 1</u>	<u>Team 2</u>	<u>Team 3</u>	<u>Team 4</u>
Audi	Audi	Audi	MACS
BMW Group	BMW Group	BMW Group	GM
DaimlerChrysler	DaimlerChrysler	DaimlerChrysler	Neutronics
Ford	Ford	Ford	CPS Products
General Motors	General Motors	General Motors	Norco Industries
Porsche	Porsche	Volkswagen	Robinair
PSA	Volkswagen	Air International	Snapon
Renault	Dayco	Bergstrom	Skye
Volkswagen	Denso	Denso	Inficon
	Dow Automotive	Dow Automotive	Spectrolite
	Parker Hannifin	Eaton	Hickok
	Trelleborg	Fujikoki	U-View
	Valeo	Sanden	RTI
	Visteon	Sanyo	
		Valeo	
		Visteon	

CRP150-1 Toxicology assessment

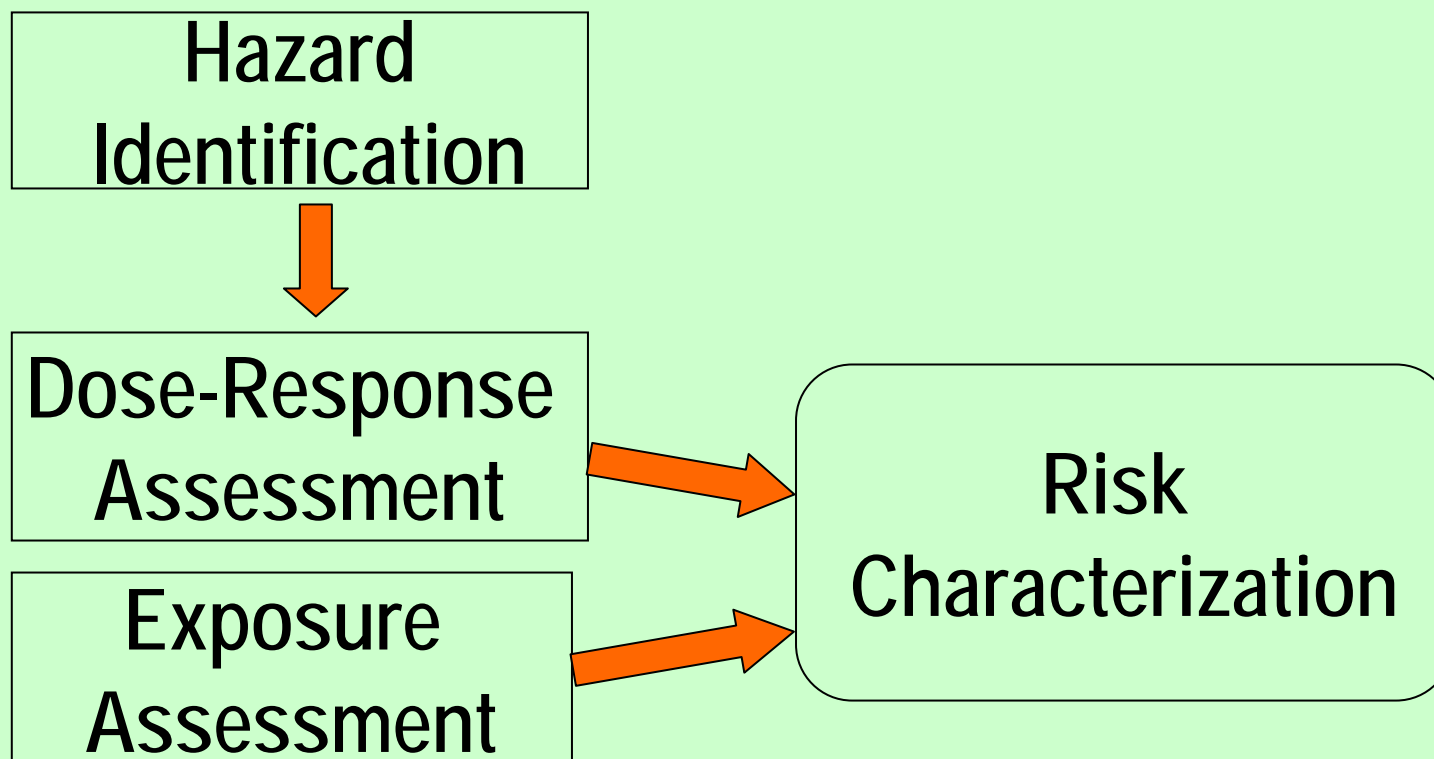
- ❖ Initial summary spreadsheet developed
- ❖ Inputs are being collected and assessed from each refrigerant supplier
- ❖ Risk assessment methodology being developed

Risk Assessment Approach

- ❖ Employ standard risk assessment approach tailored to U.S. EPA Significant New Alternatives Policy (SNAP) issues
- ❖ Based on US EPA/US Army risk evaluation for CO₂ and HFC-152a (February 2005)
- ❖ Peer reviewed by automotive industry engineers/scientists
- ❖ Likely an iterative process with new evaluations conducted to address concerns as they arise

Risk Assessment

- ❖ Employ standard risk assessment approach tailored to address SNAP issues



CRP150-2 Material Compatibility Assessment

- ❖ All testing done by independent labs
 - Thermal stability
 - ✓ Two Temperatures
 - ✓ Three refrigerants, each with its own oil
 - ✓ Two moisture levels
 - Refrigerant/lubricant compatibility
 - ✓ Solubility
 - ✓ Daniel plots?
 - Elastomer compatibility
 - ✓ Three refrigerants, one lubricant for each, two temperatures
 - ✓ Different temperatures for high and low temperature materials
 - Elastomer permeation
 - ✓ Three refrigerants
 - ✓ Different temperatures for low and high side hoses

Proposed CRP150-2 Metrics

<u>Test Category</u>	<u>Metrics</u>	<u>Comment</u>
Thermal stability	<ol style="list-style-type: none"> 1. Coloration 2. TAN 3. Refrigerant breakdown 	Still under discussion
Refrigerant/lubricant compatibility	<p>-40 to 100 C solubility</p> <p>Viscosity/Daniel plots?</p>	Still under discussion
Elastomer compatibility	<ol style="list-style-type: none"> 1. Hardness Change (shore A) 2. Tensile Strength Change 3. Elongation Change 4. Stress @ 100% Change 5. Volume Change 	Still under discussion
Elastomer permeation	<p>Total leakage quantified</p> <p>Selective leakage quantified</p>	Still under discussion

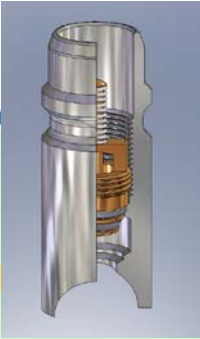
CRP150-3 System Performance Assessment

- ❖ System performance done at independent lab
 - Focus on dual evaporator systems and fixed compressor first
 - ✓ Charge determination
 - ✓ Performance
 - ✓ Temperature distribution
 - ✓ Frost sensitivity
 - Evaluation items
 - ✓ Effect of various refrigerant mixture percentages
 - ✓ Effect of new components [IHx]
 - ✓ Effect of different heat exchangers
 - ✓ Effect of changing compressor capacity
 - ✓ Effect of changes to plumbing

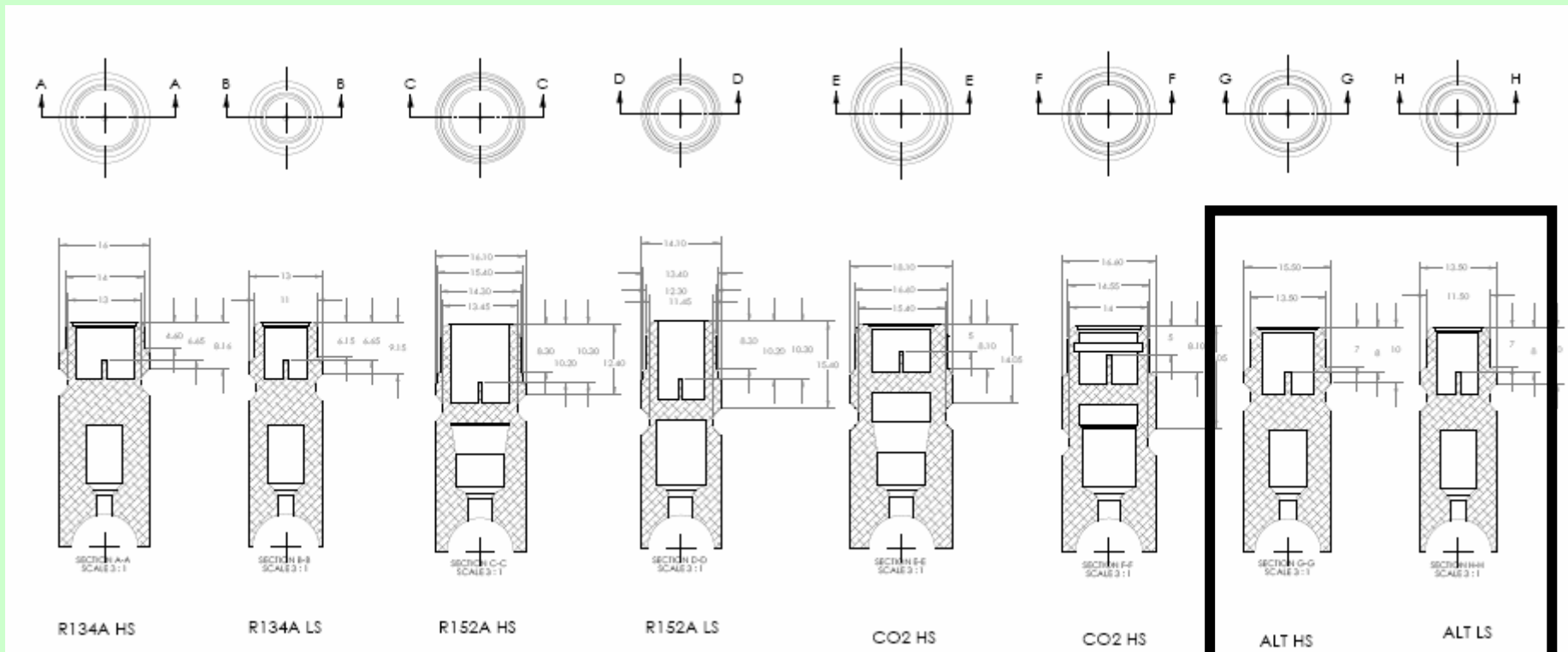
Proposed CRP150-3 Metrics

<u>Test Category</u>	<u>Metrics</u>	<u>Comment</u>
Charge	Sensitivity relative to R134a baseline	Still under discussion
Performance	<ol style="list-style-type: none"> 1. Capacity vs R134a 2. COP vs R134a 	Still under discussion
Temperature distribution	Sensitivity relative to R134a baseline	Still under discussion
Frost	Sensitivity relative to R134a baseline	Still under discussion

- ❖ Initial formation meeting 02FEb07 at MACS convention
 - Initial focus on new service fitting required for any new alternative
 - ✓ Service hose and quick coupling is also needed
 - Once new refrigerant is determined
 - ✓ Refrigerant charge and reclaim equipment standards will be developed
 - New equipment will be required
 - Venting is not permitted
 - May require refrigerant be returned for re-formulation prior to reuse
 - ✓ Safe handling standard may be required
 - Regular meetings will start from the end of February



First fitting proposal



Current J639 Service Fittings

Proposed Fitting
For new
Refrigerant

CRP150 Summary

- ❖ Toxicity data collection is underway
 - Updating testing as new results are received
 - Discussing risk assessment methodology
- ❖ Thermal stability testing to begin 15Feb07
- ❖ Permeation testing, solubility testing, and elastomer compatibility to start in March 2007
- ❖ Baseline testing has started for system test
 - First new refrigerant in Feb, 2007
 - Six weeks allocated to each refrigerant
 - Results complete and reported in June, 2007